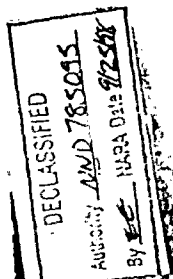


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SUPERSEDING  
Fed. Spec. F-S-641  
February 3, 1931

FEDERAL STANDARD STOCK CATALOG

Section IV

(Part 5)

FEDERAL SPECIFICATION

FOR

SOLVENT; DRY-CLEANING

This specification was approved on the above date by the Director of Procurement for the use of all departments and establishments of the Government, and shall become effective not later than April 15, 1939. It may be put into effect, however, at any earlier date after promulgation.

A. APPLICABLE FEDERAL SPECIFICATION.

A-1. The following Federal specification of the issue in effect on date of invitation for bids shall, in so far as applicable, form a part of this specification:

VV-L-791—Lubricants and Liquid Fuels; General Specifications (Methods for Sampling and Testing).

B. TYPE.

B-1. Dry-cleaning solvent shall be of but one type.

C. MATERIAL.

C-1. Unless otherwise specified, dry-cleaning solvent shall be the petroleum distillate known in the trade as "Stoddard Solvent," and shall conform to the requirements herein.

D. GENERAL REQUIREMENTS.

D-1. See section E.

E. DETAIL REQUIREMENTS.

E-1. Solvent, dry-cleaning.—

E-1a. Appearance shall be clear and free from suspended matter and undissolved water.

E-1b. Color shall be water-white or not darker than 21 by Saybolt chromometer.

E-1c. Odor.—Solvent shall be free from rancid and objectionable odors; shall be typical of a "sweet" refined naphtha.

E-1d. Corrosive properties.—A clean copper strip shall show not more than extremely slight discoloration when submerged in the solvent for 3 hours at 212° F. (See par. F-3h.)

E-1e. Doctor test.—A negative result shall be obtained by testing according to paragraph F-3i.

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SB5739

F-5-441a-3 FEDERAL STANDARD STOCK CATALOG  
(Sept. 1938) (Section IV, part 5)

**E-1f. Sulphuric acid absorption test.**—Not more than 5 percent of the solvent shall be absorbed by concentrated o. p. sulphuric acid when tested in accordance with paragraph F-3j.

**E-1g. Flash point.**—The flash point shall be not lower than 100° F. when tested in accordance with paragraph F-3d.

**E-1h. Distillation range.**—When a sample is distilled in accordance with paragraph F-3e, not less than 50 percent shall be recovered in the receiver when the thermometer reads 350° F. and not less than 90 percent when the thermometer reads 375° F. The end point (maximum distillation temperature) shall be not higher than 410° F.

**E-1i. Residue.**—When a sample is distilled in accordance with paragraph F-3e, the residue shall be not more than 1.5 percent.

**E-1j. Acidity.**—The residue remaining in the flask after the distillation is completed shall not show an acid reaction to methyl orange. (See par. F-3g.)

**E-2. Basis of purchase.**—

**E-2a. Unit.**—Dry-cleaning solvent shall be furnished either (1) by volume, the unit being a gallon of 231 cubic inches at 60° F. (15.5° C.), or (2) by weight, the unit being a pound or 100 pounds. The exact weight in pounds per gallon of any sample may be determined by multiplying the specific gravity at 60/60° F. (15.5/15.5° C.) by 8.33.

**E-2b. Correction of volume.**—If the volume of dry-cleaning solvent is corrected to the standard temperature of 60° F., the correction shall be made by means of the factors given in group 2 of the Abridged Volume Correction Table for Petroleum Oils, issued by the National Bureau of Standards, Washington, D. C., and covered by section F-8a of Federal Specification VV-L-791, Lubricants and Liquid Fuels; General Specifications (Methods for Sampling and Testing). Volume corrections ordinarily are not made on less than tank car deliveries.

**E-2c. Certification.**—Dry-cleaning solvent delivered in barrels, drums, or tank cars shall either be accompanied by an official gager's certificate showing the net contents of each container and also the temperature of contents at the time of gaging or shall be subject to gaging by the purchaser's inspector. In the absence of a statement of the temperature at the time of gaging on the official gager's certificate, or in case the barrels show evidence of loss by leakage or other shortage, the delivery shall be subject to reinspection and regaging by the purchaser's inspector.

**F. METHODS OF SAMPLING, INSPECTION, AND TESTS.**

**F-1. Detection and removal of separated water.**—Draw a portion of the solvent by means of a glass or metal container with a removable stopper or top, or with a "thief" from the lowest part of the container, or by opening the bottom valve of the perfectly level tank car. If water is found to be present, draw it all out, record the quantity, and deduct it from the total volume of liquid delivered.

**F-2. Sampling.**—The method of sampling given under F-2a shall be used whenever feasible. When this method is not applicable, method F-2b, F-2c, or F-2d is to be used, according to the special conditions that obtain.

**F-2a. While loading tank car or while filling containers for shipment.**—Samples shall be drawn by the purchaser's inspector at the

FEDERAL STANDARD STOCK CATALOG F-5-441a-3  
(Section IV, part 5) (Sept. 1938)

discharge pipe where it enters the receiving vessel or vessels. The composite sample shall be not less than 5 gallons and shall consist of small portions of not more than 1 quart each taken at regular intervals during the entire period of loading or filling. The composite sample thus obtained shall be thoroughly mixed, and from it three samples of not less than 1 quart each shall be placed in clean, dry, glass bottles or tin cans, which shall be nearly filled with the sample and securely stoppered with new, clean corks or well-fitting covers or caps. These shall be sealed and distinctly labeled by the inspector; one shall be delivered to the buyer, one to the seller, and the third held for check in case of dispute.

**F-2b. From loaded tank car or other large vessel.**—A composite sample of not less than 5 gallons shall be made up of numerous small samples of not more than 1 quart each taken from the top, bottom, and intermediate points by means of a metal or glass container with removable stopper or top. This device, attached to a suitable pole, is lowered to the various desired depths, when the stopper or top is removed and the container allowed to fill. The sample thus obtained is handled as in F-2a. (See par. E-2c.)

**F-2c. Barrels and drums.**—Barrels and drums shall be sampled after gaging contents. Five percent of the packages in any shipment or delivery shall be represented in the sample. (See par. E-2c.) Thoroughly mix the contents of each barrel to be sampled by stirring with a clean rod and withdraw a portion from the center by means of a "thief" or other sampling device. The composite sample thus obtained shall be not less than 3 quarts, shall consist of equal portions of not less than 1/4 pint from each package sampled, and shall be handled as in F-2a. Should the inspector suspect adulteration, he shall draw the samples from the suspected packages.

**F-2d. Small containers, cans, etc., of 10 gallons or less.**—These should be sampled, while filling, by method F-2a whenever possible, but in case this is impossible the composite sample taken shall be not less than 3 quarts. This shall be drawn from at least five packages (from all when fewer), and in no case from less than 2 percent of the packages. The composite sample thus taken shall be thoroughly mixed and subdivided, as in F-2a.

**F-3. Testing.**—

**F-3a. Appearance.**—Examine to determine compliance with paragraph E-1a.

**F-3b. Color.**—Color shall be determined by the Saybolt chromometer—Method 10.12 of Federal Specification VV-L-791, Lubricants and Liquid Fuels (latest edition). Similar to A. S. T. M. Method D 156-34T. (Twenty-one Saybolt color is the equivalent of a freshly prepared solution of potassium bichromate ( $K_2Cr_2O_7$ ) in distilled water, containing 0.0048 gram of  $K_2Cr_2O_7$  per liter).

**F-3c. Odor.**—Note whether or not the odor conforms to the requirements of paragraph E-1c.

**F-3d. Flash point.**—"Tag" closed tester shall be determined by Method 110.11 of Federal Specification VV-L-791, Lubricants and Liquid Fuels. Similar to A. S. T. M. Method D 56-36.

F-5-441a-4 FEDERAL STANDARD STOCK CATALOG  
(Sept. 1938) (Section IV, part 5)

F-3e. *Distillation.*—The distillation test shall be made according to Method 100.14 of Federal Specification VV-L-791, Lubricants and Liquid Fuels. Similar to A. S. T. M. Method D 86-35.

F-3f. *Residue.*—The residue after distillation shall be determined as described in paragraph F-6g (9) of Method 100.14 of Federal Specification VV-L-791, Lubricants and Liquid Fuels.

F-3g. *Acidity.*—This test shall be made immediately after recording the volume of residue and shall be carried out as described in Method 510.2 of Federal Specification VV-L-791, Lubricants and Liquid Fuels.

F-3h. *Corrosion test.*—This test shall be made according to Method 530.31 of Federal Specification VV-L-791, Lubricants and Liquid Fuels.

F-3i. *Doctor test (sodium plumbite).*—

F-3i (1). *Preparation of reagents.*—

F-3i (1)a. *Sodium plumbite (doctor solution).*—Dissolve approximately 125 g of sodium hydroxide (NaOH) in 1 liter of distilled water. Add 60 g of litharge (PbO) and shake vigorously for 15 minutes or let stand with occasional shakings for at least a day. Allow to settle and decant or siphon off the clear liquid. Filtration through a mat of asbestos may be employed if the solution does not settle clear. The solution should be kept in a tightly corked bottle and should be refilled before use if not perfectly clear.

F-3i (1)b. *Sulphur.*—Pure dry flowers of sulphur, ground and screened to 100-200 mesh, shall be used and shall be kept in a closed container to protect from dust. The sulphur used shall be completely soluble in carbon bisulphide. If not completely soluble, it may be made so by heating at 110° C. for a few minutes.

F-3i (2). *Procedure.*—Shake vigorously together in a test tube 10 ml of the sample to be tested and 5 ml of sodium plumbite solution for about 15 seconds. Add a small pinch of pure, dry flowers of sulphur, again shake for 15 seconds, and allow to settle. The quantity of sulphur used should be such that practically all of it floats on the interface between the sample and the sodium plumbite solution.

F-3i (3). *Interpretation of results.*—If the sample is discolored, or if the yellow color of the sulphur film is noticeably masked, the test shall be reported as positive and the sample condemned as "sour." If the sample remains unchanged in color, and if the sulphur film is bright yellow or only slightly discolored with gray or flecked with black, the test shall be reported negative and the sample considered "sweet."

F-3j. *Sulphuric acid absorption test.*—

F-3j (1). *Apparatus.*—

F-3j (1)a. *Babcock bottle.*—One modified Babcock bottle with ground-glass stopper, graduated to 0.2 ml (see fig. 1). The total height of the bottle, including stopper, shall be 7 1/4 to 8 inches (18.7 to 20.3 cm). The bulb shall have an outside diameter of between 35 and 37 mm. The graduated portion of the neck shall have a length of 2 1/4 to 3 inches (63.5 to 76.2 mm). The total percent graduation shall be 100, subdivided to 2 percent. Each 10-percent line shall be longer than the 2 percent, and shall be numbered, placing the numbers at the right of the scale. The capacity of the neck for each whole percent

FEDERAL STANDARD STOCK CATALOG F-5-441a-5  
(Section IV, part 5) (Sept. 1938)

shall be 0.10 ml. The maximum error of the total graduation or any part thereof shall not exceed one-half the volume of the least graduation (1 percent or 0.10 ml). The 100-percent mark shall be 28 ± 1 mm from the top of the neck. The distance between bottom of the stopper and the uppermost graduation shall be not less than 10 mm. The stopper and bottle shall bear a corresponding serial number. The neck shall be provided with an accurately-ground glass stopper.

F-3j (1)b. One 50-ml graduated cylinder.

F-3j (1)c. One 10-ml pipette standardized to agree with the stoppered Babcock bottle specified above.

F-3j (2). *Procedure.*—Bring the temperature of the sample to 20° ± 1° C. Measure out 10 ml of the sample into the clean, dry modified Babcock bottle with the standard pipette and cool in ice water for 5 minutes. Add from a graduate 20 ml of cool (use ice water) reagent-grade sulphuric acid of approximately 93.2 percent (within the limits of 93.0 percent and 94.0 percent H<sub>2</sub>SO<sub>4</sub>, determined by titration of a weighed sample). The acid should be poured down the side of the bottle to prevent splashing. Again cool by allowing the bottle to stand in ice water for 10 minutes, so that the water level is above the level of the sample in the bottle. Remove the Babcock bottle from the water bath, place glass stopper previously wet with sulphuric acid in bottle and shake it violently for 1 minute. Carefully add to the bottle sufficient sulphuric acid to bring the liquid level almost to the top graduation. Centrifuge to obtain a sharp separation of the two phases, or allow the stoppered bottle to stand overnight (at least 12 hours is necessary). Place the bottle in a water bath at 20° ± 1° C. for 15 minutes. Add sulphuric acid, previously brought to the temperature of 20° C., to bring the liquid level exactly to the top graduation. Read the scale at the lower surface of the solvent and report as percentage absorbed in sulphuric acid.

G. PACKAGING, PACKING, AND MARKING FOR SHIPMENT.

G-1. *Packaging.*—Unless otherwise specified, commercial packages are acceptable under this specification. (See par. E-2c.)

G-2. *Packing.*—Unless otherwise specified, the subject commodity shall be delivered in standard commercial containers, so constructed as to insure acceptance by common or other carriers, for safe transportation, at the lowest rate, to the point of delivery. (See par. E-2c.)

G-3. *Marking.*—Unless otherwise specified, shipping containers shall be marked with the name of the material and the quantity contained therein, as defined by the contract or order under which the shipment is made, the name of the contractor, and the number of the contract or order.

H. REQUIREMENTS APPLICABLE TO INDIVIDUAL DEPARTMENTS.

H-1. The following departmental specifications of the issue in effect on date of invitation for bids shall form a part of this specification.

H-1a. *Army.*—U. S. Army Specification No. 100-2, Standard Specification for Marking Shipments.

H-1b. *Navy.*—Navy Department General Specifications for Inspection of Material (copies of which may be obtained without cost upon application to the Bureau of Supplies and Accounts, Navy Department, Washington, D. C.).

P-8-441a-4 FEDERAL STANDARD STOCK CATALOG  
(Sept. 1938) (Section IV, part 5)

- H-1c. *Marine Corps.*—Instructions issued by the Quartermaster.  
H-2. *Navy Department purchases.*—  
H-2a. *Marking.*—Unless otherwise specified, shipping containers shall be marked with the name of the material and the quantity contained therein, as defined by the contract or order under which the shipment is made, the name of the contractor, the number of the contract or order, and the gross weight.  
H-3. *Veterans' Administration purchases.*—  
H-3a. Dry-cleaning solvent shall be furnished with a flash point of not lower than 100° F. or with a flash point of not lower than 140° F. as specified in the invitation for bids.  
H-3b. When dry-cleaning solvent with a flash point not lower than 100° F. is specified, the material delivered shall conform in all respects to this specification.  
H-3c. When dry-cleaning solvent with a flash point not lower than 140° F. is specified, the material delivered shall conform to this specification in all respects except: (a) the flash point shall not be lower than 140° F. when tested in accordance with paragraph F-3d, and (b) when distilled in accordance with paragraph F-3e, 50 percent and 90 percent shall not be required to be recovered in the receiver when the thermometer reads 350° F. and 375° F. respectively.

L NOTES.

- I-1. The product conforming to all of the detail requirements set forth in section E is known commercially as "Stoddard Solvent" and conforms to the requirements of "Stoddard Solvent—Commercial Standard CS3-38," issued by the National Bureau of Standards, Department of Commerce. This publication may be procured at 5 cents per copy from the Superintendent of Documents (see par. I-5).  
I-2. Requests for bids should state whether quotations are desired by the gallon, pound, or 100 pounds. (See par. E-2a.)  
I-3. It is believed that this specification adequately describes the characteristics necessary to secure the desired material, and that normally no samples will be necessary prior to award to determine compliance with this specification. If, for any particular purpose, samples with bids are necessary, they should be specifically asked for in the invitation for bids and the particular purpose to be served by the bid sample should be definitely stated, the specification to apply in all other respects.  
I-4. This specification covers only the types, classes, grades, sizes, etc., of the commodity as generally purchased by the Federal Government, and is not intended to include all of the types, etc., which are commercially available.  
I-5. An index of Federal specifications may be purchased as noted in the paragraph next below, price to be obtained from the Superintendent of Documents.  
I-6. Copies of this specification may be obtained upon application, accompanied by money order or coupon, or cash, to Superintendent of Documents, Government Printing Office, Washington, D. C. Price 5 cents. Federal Specification VV-L-791a, Lubricants and Liquid Fuels; General Specifications (Methods for Sampling and Testing), may be obtained at 15 cents per copy from the same source. Supplement to National Bureau of Standards Circular No.

FEDERAL STANDARD STOCK CATALOG P-8-441a-7  
(Section IV, part 5) (Sept. 1938)

410, entitled "Abridged Volume Correction Table for Petroleum Oils," may be obtained at 5 cents per copy from the same source.

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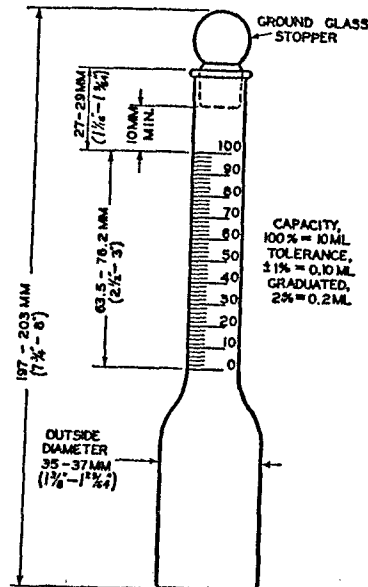


FIGURE 1.—Modified Babcock bottle for unsaturation tests.

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